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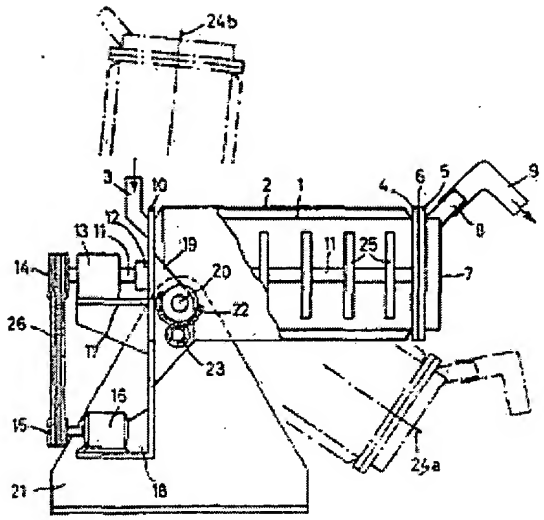
Abstract of **GB1277715**

1277715 Stirrer-ball-mills DRAISWERKE GmbH 30 April 1971 [19 June 1970] 12432/71 Heading B2A A stirrer ball-mill comprises a vessel 1 which is mounted so as to have an infinitely-variable inclination. As described, the vessel has an end wall 10 supporting a stirrer motor 16 with a transmission 14, 15, 26, a bearing 13 and a stirrer shaft 11 which are all mounted to pivot about end journals 20 which are rotatable in machine stands 21. Adjustment is effected through approximately 180 by a pinion 23 meshing with a toothed segment 22. The chamber 1 is jacketted at 2 and has an outlet sieve 6. The mill may include a pump (not shown), and an additional drive to actuate the pinion 23.



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(54) AN IMPROVED STIRRER MILL

(71) We, DRAISWERKE GMBH., a Company incorporated under the laws of Germany, of 43/53 Speckweg, 68 Mannheim 31, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a continuously operating stirrer mill consisting of a grinding vessel filled with grinding elements and with material to be ground and of a stirrer disposed therein, rotating at high speed, and producing flows of material and grinding elements in the grinding vessel, and further of a device disposed at the outlet of the grinding vessel for separating the grinding elements from the outgoing fine material. The flows produced by the stirrer keep the material to be ground and the grinding elements are subjected to flotation forces by the material pumped through.

Mills of this kind are known. They consist in particular of vertically disposed, relatively slender grinding vessels which are filled with grinding elements to the extent of 50—70% and in which a stirrer rotates. The feed material, formed into a liquid suspension, is pumped to these mills, preferably from below, and is discharged from the milling vessel at the top, optionally after passing through a sieve or other separating device retaining the grinding elements.

Apart from special cases, the best grinding effect is obtained when the mixing movement of the mill on the one hand through the movement of the mixing mechanism and the flotation, as a reaction to gravitational acceleration, on the other hand are so adjusted relative to one another that the grinding elements are distributed extremely uniformly in the grinding region.

This condition however is obtained only if in a given mill the amount and viscosity of the material pumped through correspond to optimum values. Since on the other hand the fineness of grinding is also dependent to a great extent on the residence time and thus on the speed at which the material is pumped through the grinding vessel, the optimum condition of movement of the grinding elements is obtained only infrequently. If the fineness requires a lower pumping power, the grinding elements collect predominantly in the bottom region of the grinding vessel. In the limit case of low viscosity and high comminution it may occur that the grinding elements will be concentrated in the bottom region of the grinding vessel in such a manner that the circulation necessary for grinding is disturbed. Wear on the grinding elements and impermissible generation of heat are the result.

It is true that in such cases the expedient of pumping the feed material through more quickly is occasionally adopted, in order in this manner to lift the elements to obtain a sufficient degree of movement, but the disadvantage of having to pass the material through the mill a number of times must then be accepted. This measure however constitutes only an unsatisfactory solution, particularly as special additional equipment, pumps, vessels, and the like are always required in order to pass the material through the mill a number of times.

In addition, stirrer mills in which the grinding vessel is disposed horizontally are already known. Similarly to the vertical arrangement of the grinding vessel, however, optimum distribution of the grinding elements is obtained only under clearly defined working conditions in stirrer mills with rigidly mounted horizontal grinding vessels. In the horizontal machine, for example, optimum distribution of the grinding elements is ensured only if with a correspondingly lower viscosity of the feed material and lower pumping power the mixing effect of the stirrer in the axial direction is greater than the flotation forces acting through the feed material on the grinding elements.

The stirrers are in this case usually constructed in the form of discs, and these stirring discs may be disposed in compartments or groups, acting oppositely or in one direction, on the stirrer shaft.

In one of the known types of mill is adaptation or adjustment of the most favourable distribution of grinding elements to suit viscosity and/or the throughput of the feed material possible.

The problem underlying the invention consists in providing a stirrer mill the range of application of which is made very wide in respect of the viscosity of the material to be ground and of the desired pumping power and which can be adapted to the various viscosities and throughputs of the fede material so as to obtain optimum distribution of the grinding elements in the grinding vessel in order to achieve the best possible degree of fineness under the given conditions.

According to the invention there is provided a stirrer mill comprising a grinding chamber, a stirrer rotatably mounted therein, grinding elements retained in said chamber and adapted to be moved about in said chamber by the flow produced by said stirrer and separating means positioned at the outlet to said chamber for separating said grinding elements from the ground material, wherein the chamber is so mounted that the inclination thereof is infinitely variable.

According to another feature of the invention the grinding vessel can be adjusted with infinite variation from the vertical position with the outlet at the top into the horizontal position.

In further development of the invention the grinding vessel may also be adjusted over a still greater angular range if it is, for example mounted on a pivot pin in a bearing support and is adapted to be tipped, with infinite variation, from the vertical position with the outlet disposed at the top, beyond the horizontal position and into the vertical position with the outlet situated at the bottom.

In respect of the progressive nature of the invention it will be indicated with the aid of examples how the mill can be adapted to various products to be ground by adjusting the position of the grinding vessel, without other modifications. For a given mill the following tasks require completely different inclinations of the vessel:

An aqueous product of a low viscosity but requiring great comminution, with a throughput of about 100 litres per hour is most favourably processed with the mill disposed horizontally;

When a lower degree of fineness is required the same product can be passed through the mill with a throughput of 500 litres per hour. In this case the grinding elements would collect excessively at the outlet if the grinding vessel were horizontal. With the stirrer mill according to the invention the grinding vessel is therefore moved out of the horizontal position into an inclined position, the optimum distribution of grinding elements being achieved in this example with an inclination of about 30° in the direction of the outlet;

If the product of the previous examples is passed through the mill with a throughput of 1800 litres when a still lower fineness is required, the grinding vessel is in this case set practically vertically in order to obtain perfect distribution of the grinding elements.

With products of higher viscosity and with a correspondingly lower throughput the procedure may be similar. For low viscosity products with very great tendency to settle and cement it may even be advantageous for the outlet side of the grinding vessel to be disposed lower than the inlet side.

Another advantage of the stirrer mill with adjustable inclination of the vessel results from the abiilty to clean the mill or change the sieve and grinding elements in a particularly simple manner.

Further features and advantages of the invention will be explained with reference to the drawing, which illustrates diagrammatically one form of construction of a continuously working stirrer mill according to the invention.

One example of construction is illustrated in the drawing. 1 designates a grinding vessel having a double wall 2. The feed material is fed under pressure through an inlet 3 to the vessel 1 by means of a pump (not shown). The vessel 1 contains a stirrer of any kind, which is driven at high speed and which has a stirrer shaft 11 and, for example, stirrer discs 25. At the end of the vessel 1 a flange 4 is provided. Between this flange 4 and a flange 5 of the outlet lid 7 a sieve 6 is interposed. Any other separating devices may naturally also be used. On the outlet lid 7 there is provided an outlet pipe 8 with a rotatable hose connection 9. The grinding vessel 1 is made fast to an inlet end wall 10. The stirrer shaft 11 is sealed in relation to the end wall 10 by a stuffing box 12. The stirrer shaft 11 runs in a bearing 13, and is driven by a motor 16 with the aid of belt pulleys 14 and 15 and a V-belt 26. The bearing 13 is fastened by a cross-member 17 and the motor 16 is fastened by a cross-member 18 to the end wall 10. The end wall 10 also carries fixed bearing blocks 19 with end journals 20. These end journals 20 are rotatable in machine stands 21. The grinding vessel together with its drive can be adjusted as desired, through approximately 180°, by means of toothed segment 22 which is secured to one of the blocks 19 so as to be coaxial to the journal 20, and a pinion 23 which is rotatably mounted on one of the stands 21 so as to mesh with the segment 22.

The grinding vessel axis 24 is also shown in broken lines in the drawing with the outlet end of the vessel in two positions 24a and 24b.

The invention is not restricted to the ex-

ample of embodiment described and illustrated. An additional driven may also be provided for tipping the grinding vessel and the latter may be mounted in the machine stand in a modified manner.

WHAT WE CLAIM IS:—

1. A stirrer mill comprising a grinding chamber, a stirrer rotatably mounted therein, grinding elements retained in said chamber and adapted to be moved about in said chamber by the flow produced by said stirrer and separating means positioned at the outlet to said chamber for separating said grinding elements from the ground material, wherein the chamber is so mounted that the inclination thereof is infinitely variable.

2. A stirrer mill according to Claim 1, wherein the grinding chamber is adjustable from a vertical position in which the outlet is disposed at the top thereof into a horizontal position.

3. A stirrer mill according to Claim 1, wherein the grinding chamber is adjustable with infinite variation from a vertical position in which the outlet is disposed at the top beyond the horizontal position to the vertical position in which the outlet lies at the bottom.

4. A stirrer mill according to Claims 1 to 3, wherein the grinding chamber with the stirrer and a stirrer drive unit is mounted on end journals on a machine stand.

5. A stirrer mill according to Claim 4, wherein a bearing for said stirrer, the stirrer shaft, a stirrer drive motor and the bearing blocks for the end journals are disposed on an end wall secured to the grinding chamber.

6. A stirrer mill substantially as described herein with reference to the accompanying drawings.

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